SPARK

REPORT

STRATEGIC PLANNING FOR APPLIED RESEARCH AND KNOWLEDGE

Science Council of British Columbia

FORESTRY RESEARCH AND DEVELOPMENT IN BRITISH COLUMBIA

'A VISION FOR THE FUTURE'

PREPARED BY THE
FORESTRY PLANNING COMMITTEE
FOR
THE SCIENCE COUNCIL OF B.C.

OCTOBER, 1989

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EXECUTIVE SUMMARY

The forest sector remains the driving force behind the economy of British Columbia. But its position of dominance is under assault--not by secondary industry, not by other resource sectors, not by the service sector, but rather by the changing nature of the resource.

Logging has been carried out in the mature and over-mature forests of British Columbia for more than 125 years. But although forests are a renewable resource, reliance upon over-mature stands eventually must end. As the forest sector enters middle age, it becomes increasingly urgent that it give considered thought to the face that it will wear tomorrow.

Land use is changing. And the landscape is changing. Throughout British Columbia, reforestation is bringing forth the second growth stands that will be the forest resource of the future. The needs of other resource users must be met then and now. Resource management for multiple use continues to be an integral part of the forestry cycle.

Reforestation is a major priority for the province's forest sector, yet comparatively little experience has been acquired on the nature of the second-growth resource. Its contribution to British Columbia's economic well-being will depend not just on quantity, but on quality, for that will determine whether its conversion in the sawmills, the panel board mills, the pulp mills and the paper mills of British Columbia will result in products that meet the demands of the marketplace.

In its maturity, the province's forest sector will awake one morning to find that its dependence upon second growth is total. Whether that dawning will mark a day of crisis or of opportunity will depend upon whether, by a careful program of investment, the forest sector has assured itself of the best possible resource to work with.

What must be the nature of that investment? That is the question which has been addressed by the members of the Forest Planning Committee in responding to the challenge of the Science Council of British Columbia to examine ways of applying science and technology to the forest resource.

Far greater investment in forestry research and development is singled out by the Committee as the most important contribution the forest sector can make towards its vision of even greater yields from the working forest of British Columbia.

There is no question that, through planting and natural regeneration, our forests will remain abundant. But unlike other countries, where foresters have long been involved in tending second growth or its successor rotations, British Columbia has little experience with the "new" forest.

Research and experience have shown that growth can be accelerated by intensive silvicultural practices. But are there limits we must recognize, or are there goals we should strive to achieve?

In Sweden, foresters are working to increase the annual average rate of growth from the current level of 2.9 cubic metres per hectare to 4.5 m^3. Sweden is spending more than twice as much on forestry research and development as is British Columbia.

The Forest Planning Committee believes that dramatic increases in the potential growth of the province's forests are biologically possible. In fact, the Committee believes the opportunity exists to raise the potential growth by a full 50% in a span of just 30 years.

That is a goal British Columbia should set for itself, the Committee recommends. Further, it anticipates that a doubling of the present growth may be biologically possible in 60 to 80 years. This assumes that an estimated 30 million hectares--less than one-third of the province's land mass--is available for forestry on a non-exclusive basis.

But equally important, there must be significant increases in expenditures for research and development and for intensive forest management.

Greater investment could mean a proportionate increase in economic contribution to the province's largest industry. Without it, the growth potential of our productive forest lands will be dimished. Annual yields will decline, as will employment, government revenues, and of course, economic spin-offs in the province overall.

Much is at stake. Efforts to secure significantly increased R&D funding will require action on the part of governments, industry, unions, research organizations, colleges, universities, and other users of the forest. The committee is optimistic that this can be done. The opportunity before us is too large not to grasp.

At present, British Columbia spends far less on forestry R&D than its competitors. Here, expenditures are just 0.26% of sales. In the United States, the figure is 1.5% and in Sweden, it is 1.75%.

Sweden's experience shows just how much progress is possible in spurring growth and improving timber quality. The Committee believes that the adoption of Swedish objectives, if not their actual models, will be of great assistance to the British Columbia forestry sector as it passes through the transition from mature and over-mature timber to second growth.

For the greatest gain, the Committee feels it is vital that forestry research and development be undertaken in the context of an agreed overall strategic plan for our forests. Already, nursery seedling development, improvements in seedling survival, reforestation techniques and protection activities have combined to maintain present harvest levels. Action is needed in other areas--inventory updates, growth and yield studies, forest management information systems (to name a few)--making it imperative that all of the players have reference to a common game plan.

Increases in wealth for the province as a whole will more than offset labour force adjustments resulting from increased productivity in the mills and in harvesting, the Committee believes. The loss of forest sector jobs will be halted as emphasis is placed increasingly on silvicultural activities and on value-added products. The quality of new jobs will be superior to those lost to automation and productivity improvements. Greater research and development activity will also result in employment gains.

The Committee strongly recommends that all of those concerned for the future health of the British Columbia economy endorse the goal of giving our forests a chance to grow at their optimum potential. In line with our decision to concentrate primarily on fibre production R&D, as a first step, funding should be sought to support the growth and yield studies planned by the Coastal and Interior Forest Productivity Councils. Securing the necessary $3.7 million per year will provide for the development of the basic data base needed to minimize risks in future planning.

Without a goal, a strategy, and a vision, the forestry sector will find itself making gradual adjustments over the long term in order to comprehend the changing nature of the resource, to catch up to the more refined demands of the marketplace, and to keep abreast of the increased expectations of an environmentally-conscious populace. That, the Committee believes, is not good enough. There is a better option for British Columbia.

INTRODUCTION

In September of 1987, the Science Council of British Columbia established a number of sectoral planning committees to identify opportunities and develop specific plans for improving the application of science and technology to the economy of British Columbia. The committees were, for the most part, based on existing committees that had been established to adjudge proposals to the Council under its Assistance Grants for Applied Research (AGAR) program.

One of the initial sectoral planning committees was the Forests and Forest Products Committee. When a forum was held to discuss their draft report, it was pointed out that the resource aspects of the forestry sector had not received adequate attention. As a result, a separate Forest Planning Committee was established to focus exclusively on the application of science and technology to the forest resource.

This report summarizes the deliberations of the Forest Planning Committee.

The sectoral committees are charged with the objective of identifying key strengths and weaknesses and of making broad recommendations. To that end, the committees include representatives of industry, universities, institutes and colleges, research institutions and the federal and provincial governments.

The recommendations of each committee are to be reviewed by the Science Council with a view to the establishment of priorities, then integrated into overall plans for science and technology by the Premier's Advisory Council on Science and Technology, and by the provincial government itself. Detailed investigations of specific opportunities and resolution of identified problems will be undertaken once priorities have been set.

The following individuals were members of the Forestry Planning Committee:

Mike Apsey (Chairman)	Council of Forest Industries
Dan Alexander	Northern Interior Lumber Sector, COFI
Ted Baker	Ministry of Forests, Research Branch
John Barker	Western Forest Products Ltd.
Tom Bird	Department of Fisheries and Oceans
John Borden	Simon Fraser University
Bill Bourgeois	MacMillan Bloedel Limited
Bob Dobbs	Forestry Canada
Ingrid Hedin	FERIC (Western Division)
Fred Hutchinson	Cariboo Lumber Manuf. Assn.
Charlie Johnson	Pacific Regeneration Technologies
Robert Kennedy	UBC Faculty of Forestry
Graham Lea	Truck Loggers Association
Don McMullan	Fletcher Challenge Canada Limited
Jack Owens	University of Victoria, Dept. of Biology
Doug Rickson	Canadian Forest Products Ltd.
Roy Strang	BCIT, Renewable Resources
Steve Tolnai	Interior Lumber Manuf. Assn.
Phil Van Mol	Assn. of B.C. Professional Foresters
Ilan Vertinsky	UBC, Economic & Policy Analysis Project
Jim Walker	Ministry of Environment, Wildlife Branch

Consultants:

Gerry Burch	Stewart & Ewing Associates Ltd.
John Witt	Western Management Consultants

BACKGROUND

As the 1980's draw to a close, the forest sector remains the driving force behind the economy of British Columbia. Forest product shipments for 1988 totalled $13.3 billion, most of it in export dollars. The number of direct employees in the forest sector was 90,000. It was estimated that indirect employment accounted for an additional 180,000 jobs.

At the present level of cut, about 80 million cubic metres of logs are harvested annually. During the last decade, the forest industry has logged about 200,000 hectares of land each year--a fraction (less than 1%) of the land base that actually comprises the working forest.

Initially, the Committee attempted to determine as precisely as possible the size of the dedicated forest land base available in British Columbia for the production of future crops. The 1984 Forest and Range Resource Analysis of the Ministry of Forests provides a table (B4) which identified the "potentially productive available and suitable" land base, for Crown land only, at 26,167,000 hectares. The Committee appreciated that some lands will no doubt be deleted from the working forest for single-use purposes such as parks or rights-of-way, but it felt too that other forested lands (mainly private and deciduous forest lands) should be considered for addition. These additions reflect the fact that the industry has recently found economic uses for deciduous species, and will doubtless find more in the future.

Therefore, using the data available to it, the Committee put the present productive and available land base for all forest land (Crown and private) at an estimated 30 million hectares.

In addition to the harvesting of trees, this land base provides for other significant products and uses--fish, wildlife, water and forage, among them--that in turn support other activities. Notable among these are ranching, guiding, trapping and, of course, tourism and recreation.

In recent years, concerns over the environment and for the interests of other users of the forest have increased markedly. While the inevitable result will be to put pressure on the existing land base of the working forest, it is difficult to forecast what will be the final effect of deletions (or additions) to the allowable harvest.

What is apparent is that future planning directed at the resource traditionally utilized by the forest industry must place emphasis on the sharing of the forest with other users. As the industry comes under closer scrutiny by the public, its stewardship of the forests will be viewed in a broader context--that of its care and treatment of the land, the air and the water. Its degree of commitment will be measured by its success in meeting the escalating demands of today's climate of environmental awareness and of substainable development.

Management Context

As has been seen, British Columbia's forests make a major contribution to the provincial economy. Government figures show that 50% of the

manufacturing shipments in the province emanate from the forest industry. This sector is by far the leading resource-based industry in terms of overall economic contribution and regional impact, and it is B.C.'s most important industrial sector. It is the main export earner as well as a leader in manufactured shipments and value-added products in B.C. Further, the forest industry is the primary generator of manufacturing employment, and the viability of many rural communities depends solely on this industry. This strength is based on a sustainable timber supply with the assurance that associated forest benefits and environmental quality are maintained. Much of the province's development in the past was spurred by the successful utilization of existing stands of timber. This remarkable progress was fostered largely by two factors. First, the province had large volumes of relatively accessible, high quality timber. Second, the demand for lumber and paper was strong when alternative sources of wood fibre in the world were either more costly or undeveloped. Development in other fields, such as recreation and tourism, has progressed along with forest harvesting, which has provided and maintained the roads that allow ready access, and the planning for integrated use of all forest resources must commence.

Forestry is now in a state of transition, due to three primary factors:

> First, the international supply of commodity wood products has increased so that international markets are far more competitive than previously.
>
> Second, the characteristics of the second growth forest which has been established to sustain production from areas where harvesting has taken place will be different in terms of growth rate, size and quality as compared to the original stands.

Third, the expectations of other industries and of the general public about the uses of the forest are changing, meaning that multiple use will have to be factored into research and planning in increased measure.

Transition does not mean attrition. Making gradual adjustments over a long period of time to meet changes in international market places and in domestic expectations is not a luxury that is available to the forest industry. Reliance on second growth may be many years down the road, but research and planning for the change-over will itself consume years of thought and effort.

Clearly, at this critical juncture, a broadly-supported vision is needed of forestry in British Columbia. To ignore this challenge would mean long-term social and economic cost to the province. To accept it can be to bolster the ability of the province to deal with disruptive change, on the one hand, and to continue to give shape to the infrastructure that will be needed for sustainable development, on the other.

British Columbia's ability to adapt and respond to global and domestic trends in the forest sector will depend on many factors; such as, the capacity of the resource base to supply a suitable quantity and quality of timber, the ability to adapt to the demands by other users of the forest, the degree to which manufacturing operations are upgraded and become more market oriented, and the efficiency with which the sector operates as a whole.

Comparison with Sweden

Although the characteristics of the forests differ, British Columbia and Sweden make interesting comparisons. British Columbia is still largely

dependent on old growth, whereas Sweden's harvest is mostly of second growth or later rotations. Both countries employ similar harvest systems. In the tended forests of Sweden, forests occupy sites that generally are less productive than those of British Columbia, and research has resulted in the development of growth models during the last several decades that represent possible opportunities for B.C. in the future.

Sweden's productive forest land base of 23 million hectares produces a harvest of 55 million cubic metres annually. (The figures for B.C. are 30 million hectares and 80 million cubic metres). But Sweden is striving to increase its average annual rate of growth from the current level of 2.9 m^3 per hectare per year, to 4.5 m^3. It is working towards this objective with intensive forestry practices, such as planting (190,000 hectares a year), juvenile spacing (270,000 hectares a year), scarification (170,000 hectares a year) and fertilization (140,000 hectares a year).

Comparable figures for British Columbia (1987) were as follows:

- planting, 170,000 hectares
- juvenile spacing, 32,000 hectares
- scarification, 50,000 hectares
- fertilization, 14,000 hectares

Admittedly, the figures are lower in B.C. because some intensive forestry practices are not applicable to the same extent as in Sweden because of the preponderance of over-mature forests in the province. Nonetheless, the comparison shows that it should be feasible technically over a rotation to make a substantial increase in the current average B.C. growth rate of 2.8 m^3 per hectare per year. This can be expected if intensive silvicultural investments

are made in B.C.'s second-growth stands to the same degree that it is undertaken in Sweden. At present, British Columbia spends $2 to $3 per cubic metre on forestry projects. This compares with an average of $6 in Sweden (source: Swedish Forest Facts, 1987).

FORESTRY SECTOR MISSION & OBJECTIVES

The Committee recognized that a clearly-defined mission and a boldly-stated set of objectives must be put in place in order to give purpose and guidance to future directions of research and development expenditures for the forest resource.

Accordingly, the Committee recommends the following mission statement:

MISSION

British Columbia will continue to produce forest crops on a sustained basis and will do so with minimal adverse impact on other resources or associated forest uses.

OBJECTIVES

1. To produce, in the short term, a minimum annual harvest of 80 million m^3 from the available land base of 30 million hectares;

2. To ensure that future forestry development is compatible with the concept of sustainable development by recognizing the diverse needs of all users of the forests;

3. To capture the full potential productivity of the same land base so that the growth rate in second-growth forests (whether planted or regenerated naturally) will be increased to 120 million m^3 by the year 2020, and to 160 million m^3 by the end of the next rotation;

4. To achieve growth objectives by producing forest crops at an optimal rate, while ensuring the best possible quality and value and limiting losses due to fire, disease, insects, and blow-down; and

5. To educate and train qualified personnel capable of applying new technologies to improve operational efficiency, and the quantity and quality of the resource.

To fulfill these objectives, the Committee believes the following actions are required:

a) the development of a strategic land use incorporating plan sustainable development concepts;

b) achieving a public consensus on a forestry vision for British Columbia;

c) funding larger research and development budgets;

d) realizing government policies that encourage intensive forestry on Crown lands; and

e) the adoption of the R&D recommendations in this report, with particular emphasis on the need for growth and yield studies and management information systems.

A VISION FOR THE FUTURE

Adopting a forestry vision for British Columbia's future is an undertaking that could, on the face of it, founder forever on a sea of uncertainty. The future of the forest industry is largely dependent upon export sales, but the inherent unpredictability of the international marketplace is further confounded by currency fluctuations, outbreaks of protectionism, competition from new products and the entry of new competitors.

At home, the conceptualization of a forestry vision is clouded by complex government policies, instability in stumpage rates, land use conflicts, concerns over ecosystem diversity, an inadequately informed public, and pressure for the preservation of the ancient forest.

It is evident, therefore, that a vision for the future must be pragmatically struck. Rather than make a futile attempt to come to grips with imponderables, such a vision must deal with forces at hand that are recognizable and manageable. This philosophy accepts, for instance, the notion that any and all forestry options to be considered must include, implicity or explicity, an awareness and a concern for other users of the land base.

It is evident that a vision for the future must assess, too, whether competing interests are mutually exclusive, or whether multiple use can be realized. While the options studied by the Committee will be seen as forestry-specific, members felt nonetheless that they were compatible with the sharing of the forest.

The Committee believes the Forestry Sector Strategy for Canada, as developed by the Canadian Council of Forest Ministers in 1987, provides one basis for stating a vision for the forestry sector in British Columbia. The elements of this visionary outlook are influenced as well by experiences in other forest countries, such as the aforementioned Sweden.

The following scenarios, and their impacts, have been selected to cover most of the forest harvest options available to the people of B.C.:

SCENARIO #1

"Status Quo Option (a)" - Minimal investment option with a reduced land base.

This option assumes the present cut will be slowly reduced over the next twenty years, that the forest land base will be reduced by about 20%, that no intensive forestry projects will be carried out, that no forestry gains in growth rate will occur, and that R&D budgets will be reduced, mainly by the cancellation of the FRDA Agreement. The resultant statistics would be:

• Harvest Yield	Reduction from 80 to 65 million m^3 per year
• Land Base	Reduction from 30 million to 24 million ha (reduction of 20%)
• Silviculture Expenditure	\$2/m^3-\$3/m^3 (basic only)
• Employment (direct)	Reduction from 90,000 to 70,000 (proportional)
• Annual R&D Budgets	Reduction from \$34 to \$28 million (or less)

"Status Quo Option (b)" - Present level of research expenditure with present harvest level.

This option assumes a retention of the present cut over the next 20 years, mainly through intensive forestry projects on some older immature stands, and a maintenance of FRDA grants to rehabilitate Not Satisfactorily Restocked lands. In addition, some reduction (10%) in land base can be expected, either for reserves as parks or wilderness areas, or as sensitive site deferrals. The resultant statistics would be:

• Harvest Yield	80 million m^3 per year
• Land Base	Reduction from 30 million to 27 million ha
• Silviculture Expenditure	\$3/m^3-\$4/m^3
• Employment (direct)	90,000
• Annual R&D Budgets	\$34 million (or more)

SCENARIO #2

"Increased Investment Option (a)" - Increased investment on a reduced land base.

This option assumes a reduction of the committed land base to 27 million hectares from 30 million by the year 2020, but with an increased growth rate due to a program of intensive forestry. In addition, the R&D budgets and employment must increase as a result of the higher indicated growth potential. The resultant statistics would be:

• Potential Yield	120 million m^3 per year
• Land Base	27 million ha
• Silviculture Expenditure	\$5/m^3 on good to medium sites \$2/m^3 on remainder
• Economic Impact	Revenue to governments will increase, employment will remain static or will slightly increase, jobs will be upgraded, etc.
• Annual R&D Budgets	\$100 million

"Increased Investment Option (b)" - Greatly increased investment on the present forest land base.

This option contemplates total retention of the present forest land base of 30 million hectares, with intensive forestry applied to each hectare over the entire rotation, increased R&D budgets, and the potential to sell the increased harvest profitably. The resultant statistics would be:

• Potential Yield	160 million m^3 per year
• Land Base	30 million ha.
• Silviculture Expenditure	\$5 to 6/m^3
• Economic Impact	Revenue to governments will increase, employment will increase, jobs will be upgraded, etc.
• Annual R&D Budgets	\$200 million

The Committee recommends that "Scenario #2 - The Increased Investment Option (a)" be adopted as a reasonable vision for future planning on the need for increased R&D for forestry in B.C. The results of this scenario appear achievable with an increased R&D expenditure and the necessary operational input.

The reasons for the selection of this option are:

1. Some reduction in the available forest is to be expected because of deferrals and demands for preservation of older stands and/or the protection of watersheds;

2. Intensive forestry practices shown by research as capable of producing yield increases will nonetheless be subjected to cost/benefit analyses. Indications are that only good and medium sites will qualify for intensive management projects;

3. An estimated potential yield increase of 50% was seen by the Committee as a reasonable target for the first rotation;

4. Although employment levels are difficult to estimate, maintenance of the current level appears justifiable;

5. R&D funding must increase, largely because of the complexity of future research projects. More research is being directed towards the management of immature and second-growth stands, which received minimal attention in the past. As well, research needs will increase as competition for land use increases and as forest management practices are integrated with other resource values.

As stated earlier, current expenditures on forestry R&D total about $34 million a year. This amount helps the province to sustain an AAC of 80 million m^3. Increasing the growth rate to 120 million m^3 and, eventually, to a sustainable level of 120 million m^3, will require significantly increased R&D expenditures. It follows that intensive forestry projects would be greatly expanded where their value was confirmed by cost/benefit analyses.

The new R&D expenditure requirement would, at the minimum, be in proportion to, but exceed, the anticipated rate of increase in growth. But consideration must also be given to the fact that new research priorities are likely to be focussed on long-term studies--projects that will be much more costly than the "mission- oriented" projects of the past. Most research to date has dealt with the problems associated with over-mature stands, especially the

need to protect them from fire, disease, insects and blow-down. In the future, research projects will emphasize the management of second-growth (whether planted or naturally-established) about which relatiely little is known at present.

Given this change in direction, the Committee felt that R&D expenditures of $100 million a year would approximate the actual amount needed to tackle the task at hand. Because the planning horizons for forests are long, the eventual results of research expenditures at this level should reduce the risk to the landowner and to the industry while increasing options available to forest managers.

Committee members stressed the need for the concentration of research efforts in British Columbia on ways to increase the productivity of the existing forest land base. R&D expenditures on forestry are 0.26% of gross forest product sales by British Columbia, and 0.85% of sales by all provinces combined. It can be seen, therefore, that although British Columbia accounts for more than 50% of Canadian forest industry shipments, expenditures on forest research in this province are proportionately far less than in the other forest-product producing areas of the country.

The increase to $100 million proposed by the Committee would leave forestry R&D expenditures in British Columbia (as a percentage of sales) still well below those of competitive countries and other provinces.

During the course of its deliberations, it became evident to the Committee that British Columbia suffers from the lack of an overall Strategic Plan for the Forestry Sector. Ideally, such a plan would put in place broad guidelines for the province as a whole, but would also incorporate the flexibility needed to deal with issues at the regional or local level. The plan would recognize the uncertainties inherent in a resource industry that must cope with long rotations, changes brought about by transition to second growth and the integration required with other forest users.

Responsibility for the preparation of such a Strategic Plan should be assumed by the provincial government, possibly through the recently-proposed Forest Research Council.

The Committee noted that because of the absence of such a plan it has had to make numerous assumptions with respect to the integrity of the forest land base, the level of future harvests, a vision for the future, and a strategy for research and development.

R & D IMPLICATIONS

I. CURRENT STATUS

The Committee determined that its initial mandate was to provide answers to the following three questions: -

1. What is the level of R&D funding in B.C. at the present time?

First, the committee concentrated on research categories that impact on future yields. Then, each research agency was requested to submit their 1989 budgets for each category, following an accepted set of principles for standardization (Appendix II). It was appreciated that additional research, particularly on forest products and manufacturing, is also being carried out by other agencies and companies at the present time. Therefore, the Committee concentrated only on "established" forestry research categories which are carried out by the larger forest research agencies and companies for this study.

Appendix II shows that the largest single category is Reforestation, for which about 26% ($8.8 million) of the present $34 million is being spent. The next highest level of about $3 million each is spent on harvesting, protection, brushing and weeding, stand management and technology transfer. Some of the areas that will require increased emphasis in the future are growth and yield studies, forest management information systems and planning, biotechnology, integrated management studies and climatology.

2. What is the source of R&D funds?

The replies to our questionnaire indicated that the majority of present R&D funds are provided by the provincial and federal governments, with under 10% being provided by the forest industry (Appendix I). The primary reasons for the strong involvement of governments relate to the high percentage of public ownership and the historic government involvement in forest research.

3. What is the continuity of R&D funds?

Research budgets are subject to wide fluctuations dependent on political and economic considerations of governments. For example, the FRDA Agreement allocated nearly $6 million to forestry R&D in 1989, but this grant is due to expire in the spring of 1990, with no certainty of renewal. Many significant research projects could be affected by a decision not to renew the FRDA Agreement in B.C. One of the results of uncertain funding is the lack of long-term studies, which are so important in forest research.

Further, the following questions were addressed by the committee:

1. Is sufficient research being carried out to permit the development of optimal programs to enhance management and the productivity of B.C.'s forests?

2. Who in the forestry sector should carry out these programs?

3. How should the programs be financed?

Three important facts were identified, namely:

(1) The relatively low level of R&D budgets for forestry in B.C.

In 1985, B.C. spent only 0.26% of forest products sales dollars on forestry (silvicultural research and development), compared to 0.85% in Canada as a whole, 1.5% in the U.S. and 1.75% in Sweden.

(2) About 90% of all forestry R&D in B.C. is funded by federal and provincial governments. Industrial participation is about 10%.

The Committee feels that forestry R&D in this province should be a shared responsibility, with governments financing the projects, and industry committed to delivering the programs. Therefore, the Committee recommends that governments not only increase incentives for industrial R&D projects but also consider funding mechanisms which will promote investment in intensive forestry projects.

(3) The uncertainty of government funding for R&D research.

Continuity of funding for research is necessary and fundamental in developing a long-term program.

In order to correct these three problems, the Committee recommends that governments and industry develop a long term national and provincial strategic plan for R&D related to silviculture programs.

II. NEED FOR R&D

Until recently, forest research and development conducted in the province dealt primarily with timber production and processing. Considerable efforts were devoted to improving log quality, increasing the rate and success of replanting, mechanizing harvesting and processing activities, and reducing the impacts of wildfire, insects, disease and other factors that destroyed or devalued timber.

The federal Ministry of State for Science and Technology commissioned a study (1987) on new technology in the forest sector in Canada and reports as follows:

> "Expenditures on forestry R&D in Canada are well below the levels of our major competitors and of other industrial sectors in Canada. In comparison to our competitors, Canada's approach to forestry R&D is unfocused, unco-ordinated, under financed and lacks problem - or goal - orientation. From an industrial point of view, the main difficulty is that the industry as a whole suffers from too much debt, too little shareholders' equity, and too small a return on invested capital. Until the industry gets its collective balance sheet in order, the opportunity to fully take advantage of existing technology is not there and the commitment to developing new technologies will not be total. From a governmental perspective, lack of both strong political influence and an easily defined and united constituency at the federal level, coupled with provincial control of the resource base, have left the forest sector without the political influence of other resource sectors. Without this strong political presence, the forest sector is unable to establish itself in the federal governmental process which traditionally leads to the development and application of technology to the degree possible in the other resource sectors."

These views are even more applicable to the forestry scene in British Columbia.

The Forest Planning Committee believes that a vision for forestry must also be supported by a planned forest research strategy. Research must focus on providing the information to manage the overall forest resources of the future, including new areas of investigation to respond to changing public expectations of our forests. The Committee has concentrated on R&D needs for timber production, primarily for industrial use, while recognizing the constraints being introduced by the multiple use concept. Other SPARK committees will no doubt address many of the concerns of the other users of the forest. The challenges of integrated forest management, and the commitment to sustainable development, as stated in the Strangway Report on the Environment and Economy, means that forest research must continue to develop knowledge to achieve a balance of uses for forest lands in the province.

The Committee feels strongly that R&D is critical to sustaining the present level of harvest in the industry, as well as to achieving higher potential yields from the forest land base. At present, $34 million a year is spent on R&D related to forestry. R&D has the potential of providing technology that may be used to achieve increases in forest productivity, but the actual implementation of "improved" practices is dependent on many factors. To increase fibre yields, the following major steps are required:

1. An excellent inventory of all basic resources.

2. Access to the basic data for strategic planning.

3. A high standard of basic forest renewal and forest tending.

4. A program of intensive forestry expenditures.

5. A long term R&D program and budget to determine biological responses to various treatments, and their economic viability.

6. Studies on methods of reducing silvicultural and harvesting costs so that the future yield will be economic to extract.

7. Studies to develop products and policies that will encourage maximum utilization of the resource.

III. PRIORITIES FOR R&D

The Committee has developed the following priority list for future R&D activities:

1. Increase emphasis on forest management information systems, including an updated forest inventory, and well supported by growth and yield studies of second-growth stands on both natural and, particularly, treated stands.

2. Concentrate on site productivity studies on stands of varying species mix, on varying sites, and with varying silvicultural regimes.

3. Continue emphasis on reforestation research, including initiation of research into hardwood silviculture and alternative silvicultural systems.

4. Increase research on the integration of forest management practices with other resource values and uses of the land base.

5. Increase product research with emphasis on new competitive products from second-growth stands of both conifer and hardwoods.

6. Support the development and adoption of high technology products and services in forestry, such as the use of tree breeding and biotechnology to produce superior and adaptable seedlings for reforestation.

7. Continue emphasis on the present supportive forest research fields, such as protection and climatology.

8. Enhance emphasis on technology transfer, and the development of methods to transfer "known" research results effectively to the field managers. Identify, and, where possible, remove institutional or organizational obstacles to the application of research findings.

The above priority list, particularly the top two categories, recognizes the critical need for a growth and yield data base for determining future decisions. Over many decades, the financial requirements and the staffing needs for our top priorities has not received sufficient attention. At present, there is a renewed interest in the potential of restocked areas, which, if managed properly, can stabilize, if not increase substantially, existing allowable cuts. The Committee strongly supports the growth and yield long-term plans developed by the Coast and Interior Forest Productivity Councils which represent the entire forest sector. Funding of $3.7 million is an immediate goal for this work. Recognition is also given to the need to integrate these studies to include the interface between forestry and other resource users of the forests.

The Committee also recognizes that basic research is needed, in addition to R&D in the applied activities listed above. However, the outcome, value and applications of basic, untargetted research cannot be predicted accurately. Without such basic research, advances in the applied sector will eventually cease. It also recognizes that despite the existence of strategic research plans, innovative researchers (either basic or applied) may produce novel results that allow unanticipated, quantum leaps in productivity or services to occur. Therefore, a balance must be achieved, such that the majority of research is user-generated and fulfills specific strategic needs, while a critical portion of research (perhaps 25%) is researcher-generated, and is funded primarily on the basis of its innovation and quality.

In addition, the Committee recognizes that an increased flow of trained researchers, foresters, and technologists must be produced by the universities, colleges and institutes in the province, to undertake the increased research, and to utilize and apply the findings effectively. Increased support for post graduate students in these institutions is recommended as an effective method of increasing the research effort and co-ordinating programs. Further, all forest employees must be encouraged to keep up-to-date on the "leading edge of new forest technology" through in-service programs and extension activities, such as those offered by the Silviculture Institute of British Columbia.

ECONOMIC IMPLICATIONS

The Committee acknowledges that the economic future of the forest industry in B.C. depends on a large number of factors. However, significant economic gains can be realized by increasing the volume and value of forests in the province. To obtain these gains, greater emphasis must be placed on many factors, some of which are an adequate supply of quality fibre, increased research budgets, increased investments on intensive forestry projects, etc. At the same time, an indicated increase in growth rate, partially based on R&D results, can be utilized for many purposes, such as maintaining present allowable cuts, helping address increasing demands on available forest land by other resource users, and also being available for increased harvests, if feasible and justified.

However, the Committee has focussed its assessment of the impact on the provincial economy that will result from increased yields by assessing the probable impact on B.C.'s economy of projected reductions in yields over the next few decades. The major benefit of an increase in harvest will be increased economic activity and an attendant increase in the standard of living of our citizens. Any increase in harvest will help to offset an inevitable decline in direct employment. These factors are more easily forecast than the dollar value of resultant forest products, which will be influenced significantly in the future by value-added activities, markets and foreign exchange rates, which cannot be predicted reliably.

To project employment levels resulting from increasing sustainable harvest levels in the future to 120 million m^3 annually requires the following assumptions:

1. That the forest products from this higher level of logging production can be sold profitably.
2. That present forest industry production facilities are operating at capacity or close to capacity with an existing workforce. Therefore, any increased harvest will require the construction of new plants and additional work force.
3. That increased employment will be created by the new silviculture projects.
4. That incentives will be introduced to encourage industry to embark on cost-effective, intensive silviculture projects.

These assumptions seem reasonable. If so, the increase in <u>potential growth rate</u> to 120 million m^3 should result at least in the maintenance of the present employment levels, both direct and indirect.

Also, some improvement in competitiveness will result also from reductions in operating costs, both in harvesting of managed stands and subsequent log conversion. No estimate has been made of these gains. If the projected increase in timber harvest is realized, additional mill capacity will be required. New mills will employ fewer persons than present mills. Labour-saving, capital-intensive technology must continue to be developed, and commodity-type mills will likely continue to increase in size to realize economies of scale.

Offsetting these changes, however, will be the trend toward value-added paper and wood products. In the wood products sector, a move to higher value-added products through increased secondary manufacturing could result in a slight increase in employment. Higher value-added paper products will employ proportionately as many persons as the current product mix. Increases in employment for intensive forestry projects could be significant, helping to offset reductions due to operational efficiencies. Hence, as an approximation, a maintenance of employment, or a slight increase, can be assumed.

FOREST INDUSTRY COORDINATION & RESPONSIBILITY

This complex industry consists of separate, yet interacting sectors: forestry, wood products, pulp and paper, machinery and equipment, consulting, and research and development. The climate needs to be enhanced in the industry to foster further technological development within each sector and across the sectors.

To assure continued growth, all elements of the forest industry must agree on a long-term goal for science and technology, encourage technological developments within each sector, promote greater interaction and coordination between and among its sectors, improve the economic return from its timber resource, add to its commodity product focus and quality value-added products, and increase its technological competence and awareness, particularly through the development of a positive environment for innovation in order to improve technology transfer.

The Forest and Forest Products Sector Planning Report has established the following SPECIFIC GOALS, which are equally applicable to the Forestry Sector:

1. A continuation of the recognition that the forest industry is the driving force for the future of the provincial economy.
2. The addition of value to the forest products, the improvement of productivity and the improvement of management and utilization of the forest resource.
3. The improvement of technological competence and awareness throughout the industry.

4. The improvement of the transfer of technology.

5. The further increase in competitiveness of the forest industry by full utilization of advanced technology developed in the province.

Of particular interest for the Forestry Sector is goal #2. This goal focuses on using technology to add value to the forest products so that B.C. is not only the volume leader in the world but also the value leader. These added-value products will complement the continuing production of commodity products and will also create jobs in secondary industries.

With the harvesting of accessible mature and over-mature stands, the forest resource is diminishing in quality. Its changing characteristics mean that the costs of management and extraction are increasing. Research and development are needed to offset such changes and to improve the quantity, quality and cost of the fibre resource. This need is particularly evident when competition from other materials developed outside of B.C. is considered, and the pressures of competing uses of the forests are increasing; e.g., water, wildlife, recreation and community life.

The competition around the world from traditional forest products and from "new" materials will require consistent improvements in the B.C. industry's competitive edge. Science and technology can improve productivity, develop innovative products to meet customer's needs, and provide direction in resolving major issues, such as proper stewardship of B.C.'s forest resources and an appropriate level of timber harvesting.

The thrust of the SPARK program is "to increase industry's awareness and commitment to applied research through their continued participation in the sector committees, their support for sector champions, and through shared funding of major initiatives".

The anomalies of the forest industry, however, are such that these goals, in application, must be shaped to fit circumstances that are unique to this sector.

Public ownership of most of the forested lands of British Columbia has meant that traditionally the province's forest industry has been a partnership, involving a sharing of revenue through a government-controlled resource which has been developed and utilized by the private sector. But the regulatory regime that governs the forestry sector has been changing and is continuing to change. This climate of uncertainty has not been conducive to encouraging investment in silviculture research and intensive forest management.

Although the industry provides considerable support funding for cooperative research organizations (Forintek, Paprican, Feric) relating to product, equipment and market research, little funding is provided for silviculture or forest management research. The primary reason for this contrast is the fact of government control of the resource.

Industry is reluctant to invest in forestry research which is not confidential, not generally subject to patent protection, where gains attract

stumpage fees, and where achievements cannot confidentially benefit the originating company by, say, a secure increase in allowable cut or a reduction in costs.

Therefore, although the industry is concerned and interested in participating in forestry research, it expects that the federal and provincial governments will continue to take the lead in providing funding, while industry will commit itself to delivering results. This is consistent with public ownership of the forest land, private development of the resource, current financing arrangements, and associated responsibilities.

NEXT STEPS

The Forestry Sector Planning Committee recommends the following steps to implement this report:

1. Using the selected option (Scenario #2 (a)), commitments should be sought from the federal and provincial governments and the forest industry to build into their long-term plans--the vision of an increase in yield levels over the next rotation to 120 million m^3.

2. Forest planners should ensure that all users of the forests in B.C. are included in planning forest management activities, including R&D projects.

3. The provincial government should be encouraged to begin the preparation of a Strategic (Sustainable Development) Plan for forestry. A consensus of the industry, government, labour, research organizations and other user groups would be needed to support such a plan.

4. Government policy should take into account the need to generate additional R&D funds to aid in achieving growth targets; this might include the revision of corporate tax regimes to provide enhanced incentives for technologically-innovative companies, and the development of policies to encourage intensive forestry projects by industry.

5. B.C. and federal research organizations should be encouraged to focus their activities on the priorities set out in this report so that desired growth targets can be achieved. It is recommended that a comprehensive plan for research and development be formulated outlining ways of achieving a large multi-disciplinary R&D effort.

6. Strong support is needed for the Committee's two top-priority recommendations--information systems and site productivity studies. The committee recommends immediate full support for the Productivity Council's growth and yield plans. This requires an annual budget of $3.7 million. Innovative funding and organization alternatives should be examined. Ministry of Forests' development plans for management information systems should be reviewed and analyzed to determine whether they can form the basis for an overall plan for the forestry sector.

7. Strong linkages are encouraged with other SPARK sector committees, particularly Biotechnology, Information Technology, Energy, and the new Environment Committee.

APPENDIX I

FORESTRY R&D ACTIVITIES IN B.C.
1989

AGENCY		Approximate Expenditure (thousands of dollars)	
1.	MOF (Ministry of Forests)	11,900	
2.	FRDA (Forest Resource Development Agreement)	5,800	
3.	FORESTRY CANADA	9,600	
4.	FEPA (Forest Economics and Policy Analysis) (FORESTRY CANADA)	200	
5.	FERIC (Forest Engineering Research Institute of Canada)	1,900	
6.	M & B (MacMillan and Bloedel Ltd.)	800	
7.	OTHER COMPANIES	1,400	
8.	NSERC (Natural Sciences and Engineering Research Council)	1,400	
9.	OTHER PROV. MINISTRIES	800	
10.	B.C. SCIENCE COUNCIL	300	
11.	UNIVERSITIES	200	
12.	FORINTEK	200	34,250*

* The discrepancy between this figure and attached activity total is attributable to the distribution of research funds to cooperative projects that were not readily identified by the respondents.

Note: The above totals include only direct salaries, benefits, and support funding. Capital expenditures for buildings, equipment, and general overhead expenses are excluded.

APPENDIX II

WHAT R&D IS BEING DONE NOW

	PRIMARY ORGANIZATIONS INVOLVED	1989 BUDGET	TOTALS
1. HARVESTING			
• Equipment	FERIC, MOF, BCIT, UBC	1,618	
• Environmental Impacts	MOF, FORCAN, FERIC	995	
• Transportation	FERIC	440	3,053
2. PROTECTION	MOF, SFU	640	
• Fire	FORCAN, BCIT	169	
• Disease	FORCAN, CPFP, MOF	1,577	
• Insects	FORCAN, CPFP, SFU, UBC	2,877	
• Environmental Impacts	MOF	43	5,306
3. SITE PREPARATION	MOF, FRDA, INDUSTRY	854	
• Equipment	FERIC	400	
• Slash Burning	FORCAN, MOF, FRDA	224	
• Environmental Impacts	FORCAN, MOF, FRDA	254	1,732
4. REFORESTATION	MOF, FRDA	2,056	
• Natural	MOF, INDUSTRY	153	
• Genetics	MOF, INDUSTRY, FORCAN, UVIC	2,695	
• Seed & Seedling Production	MOF, INDUSTRY, UVIC, SFU, UBC	2,531	
• Ecosystems Classifications	MOF, UBC, NSERC	1,017	
• Transportation of Seedlings	BCIT, INDUSTRY, FERIC	87	
• Planting	MOF, FORCAN, UBC	289	8,828
5. BRUSHING & WEEDING	MOF, FRDA	75	
• Chemical Use	MOF, FRDA, INDUSTRY	947	
• Silviculture Burns		--	
• Mechanical Methods	MOF, FRDA, FERIC	555	
• Biological Control	FORCAN, MOF	379	
• Environmental Impacts	MOF, UBC, NSERC	914	2,870
6. STAND MANAGEMENT	FEPA	138	
• Juvenile Spacing	MOF, INDUSTRY, FERIC	515	
• Fertilization	MOF, FORCAN, FRDA, INDUSTRY, UBC	1,167	
• Commercial Thinning	FERIC, FORCAN, BCIT	420	
• Pruning	FORINTEK, MOF, INDUSTRY	64	
• Environmental Impacts	MOF	165	
• Economics	FRDA, MOF, INDUSTRY, UBC	375	2,844

APPENDIX II (cont'd)

WHAT R&D IS BEING DONE NOW

	PRIMARY ORGANIZATIONS INVOLVED	1989 BUDGET	TOTALS
7. SECOND GROWTH HARVESTING			
• Environmental Impacts	FERIC	50	
• Value of Crop (profit potential)	UBC, FEPA, FORINTEK	210	
• Market Research		--	260
8. FOREST MANAGEMENT INFORMATION SYSTEMS & PLANNING (Systems Science)			
• Forest Inventories	FORCAN, UBC	188	
• Growth & Yield Studies	MOF, FORCAN, UBC, INDUSTRY	653	
• Mapping	MOF	90	
• Modelling	MOF, FRDA, FORCAN, INDUSTRY, UBC	861	1,792
9. CLIMATOLOGY	MOF, FRDA, FORCAN	408	408
10. TECHNOLOGY TRANSFER	MOF, FORCAN, FEPA, FERIC	3,580	3,580
11. INTEGRATED STUDIES	INDUSTRY, MOF, FORCAN, FERIC, FED. FISH	1,250	1,250
12. BIOTECHNOLOGY	FORINTEK, PAPRICAN	750	750
13. WILDLIFE	MOE, FRDA, MOF, IND.	654	654
14. OTHER FIELDS	FRDA, MOF, SFU, UBC, INDUSTRY		
• Fisheries		88	
• Wood Science		112	
• Recreation		23	
• Hydrology		168	
• Worker Health & Safety	MOF, FERIC	107	
• Miscellaneous		155	653
15. BASIC SCIENCE	FORCAN, FORINTEK, UBC, SFU, UVIC	343	343
		GRAND TOTAL	$34,323

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APPENDIX III

REPORT OF THE
FORESTS AND FOREST PRODUCTS SECTOR COMMITTEE
OF SPARK (SCIENCE COUNCIL OF B.C.)

EXECUTIVE SUMMARY

APRIL 1988

This sector identifies the need to raise awareness within the province of the significance of this sector. It proposes the creation of a provincial forest industry council and the hiring of a champion. It is a key sector in focussing on a value added products, improved productivity and increased use of the resource. The need to raise the technology awareness level throughout the industry is critical to ensure an enthusiastic reception for science and technology. The focus on advanced technologies and their interface with the resource sector is emphasized as is the support for advanced machinery and equipment using cooperative research programs and tax incentives to encourage the required research and development.

It is essential that new technologies in the forest sector be transferred as quickly as possible to mills and other operations. At the same time, every effort should be made to increase awareness of and enthusiasm for such new developments. More detailed analyses of the forestry, pulp and paper and wood products sectors will be undertaken shortly. These will be similar to the one recently completed for the equipment supply sector which is included with this sector report.

The forest industry is the largest single economic sector of the provincial economy. It is the major employer, the driving force for many other economic sectors and is by far the largest part of the province's vital export

industry. It competes in an expanding world wide market. Many strengths exist now in the B.C. forest industry which provide a basis for expanding investment and employment, not only in this sector but also in secondary, high technology industries.

This complex industry consists of separate yet interacting sectors namely, forestry, wood products, pulp and paper, machinery and equipment and consulting. The industry has not had to place a high priority on science and technology in the past due to the availability of large stocks of prime timber and the predominance of commodity products. Now each sector must increase its use of advanced technology to enhance the economic benefit to be derived from a changing and more expensive resource base and to add value to its products which compete on a world wide basis with products developed from new fibre sources.

The climate needs to be enhanced in the industry to foster further technological development within each sector and across the sectors. By using the local high technology industries, on a competitive basis, the B.C. forest industry can be at the leading edge of product and equipment developments and can fully coordinate its requirements with the local suppliers.

In order to continue its growth, all elements of the forest industry will need to agree on a long term goal for science and technology in the industry, encourage technological developments within each sector; promote greater interaction and co-ordination between its sectors; improve the economic

return from its timber resource; add to its commodity product focus, quality value added products; and increase its technological competence and awareness, particularly the development of a positive environment for innovation in order to improve technology transfer.

In order to foster this climate for technology and innovation the forests and forest products sector needs to adopt the following mission for science and technology in B.C.:

> **"Recognizing the changing nature and increasing cost of its timber resource and the changing needs of its world-wide customers, retain competitively priced commodity products and develop value-added products by the increasing use of innovative technology, advanced machinery and systems, consulting, training and education."**

In order to achieve this mission, the Committee recommends that the forests and forest products sector focus on achieving the following five goals:

- a commitment to the continuing expansion and enhancement of the forest industry as the ongoing driving force for the B.C. economy;
- the continued development of value added forest products and an increase in the economic returns of the forest resource through the application of science and technology. This recommendation supports the thrust of the recent changes to the Forest Act in this province;
- an improvement in technological competence and awareness throughout the industry;
- an improvement in the transfer of technology to expedite economic benefit;
- an increase in the competitiveness of the forest industry by promoting the development of relevant high technology industries in the province.

This mission needs to be adopted and the goals reviewed and accepted by the industry, governments, universities, colleges, research institutions, advanced machinery and technology suppliers and consultants and then aggressively pursued and implemented on a co-ordinated basis. This committee recognizes that the forest industry across Canada and particularly in B.C. is currently focussing strategically on its future goals and strategies and that the recommendations of this report need to be coordinated fully with other initiatives.

SPECIFIC GOALS

The specific goals that need to be achieved in order to reach the overall mission are:

1. A continuation of the recognition that the forest industry is the driving force for the future of the provincial economy.
2. The addition of value to the forest products, the improvement of productivity and the improvement of management and utilization of the forest resource.
3. The improvement of technological competence and awareness throughout the industry.
4. The improvement of the transfer of technology.
5. The further increase in competitiveness of the forest industry by full utilization of advanced technology industries developed in the province.

1. Commitment to Continued Growth for the Forest Industry

The forest industry must continue to be recognized within B.C. as the driving force for the provincial economy and as an industry with an expanding future. A climate must be fostered to encourage investment and to fully utilize high technology.

ACTIONS

a) Continue the present public relations programs indicating the significance of the forest sector.

b) Establish a Council on Science and Technology in the Forest Industry comprised of representatives of the industry (CEO's, COFI etc.), government (Ministers of Forests, Economic Development, Advanced Education and Job Training and Regional Development), universities and colleges, unions, research institutions and major suppliers of advanced equipment and systems. This Council will agree on a strategic plan for science and technology in the industry and regularly monitor progress and report on new requirements. In addition, it will advocate courses of action to the industry, to national and provincial governments, to the universities and colleges and to suppliers and will focus the interests of all those involved on the future of the industry.

c) Ensure that the industry is adequately represented in all other significant councils advising the Premier and the government.

d) Obtain overall agreement to the mission statement for the forest industry:

"Recognizing the changing nature and increasing cost of its timber resource and the changing needs of its world-wide customers, retain competitively priced commodity products and develop value-added products by the increasing use of innovative technology, advanced machinery and systems, consulting, training and education."

2. Add Value, Improve Productivity and Improve the Resource

This goal focuses on using technology to add value to the forest products so that B.C. is not only the volume leader in the world but also the value leader. These added value products will complement the continuing production of commodity products and will also develop jobs in secondary industries.

The forest resource is diminishing in quality, changing in nature and the costs of management and extraction are increasing. Research and development are needed to offset such changes and to improve the quantity, quality and cost

of the fibre resource. This need is particularly evident when competition from other materials developed outside of B.C. is considered and the pressures of competing uses of the forests are increasing e.g. water, fuel, wildlife, recreation and community life.

The competition around the world from traditional forest products and from 'new' materials will require consistent improvements in the B.C. industry's 'competitive edge'. Science and technology can improve productivity and develop innovative products to meet customers needs.

ACTIONS

a) Increase the overall funding of R&D in the forest sector in B.C. from 0.55% of sales. The level of 0.55% of sales may continue to be appropriate for the commodity products, however significant increases will be required to develop value added products. Countries that are successfully competing with B.C. are spending 2.0%-2.5% on R&D. A careful assessment of needs is required in order to develop the specific target % to aim for and to develop a detailed strategic plan for the expenditure of these funds.

b) The federal government should clarify that it wishes to use tax incentives as a tool for economic expansion and should therefore attach a broad and consistent definition to R&D.

c) Provide financial incentives for all components of the forest sector to undertake R&D by tax incentives, write-offs and first user risk reduction programs.

d) Encourage cooperative research between users, suppliers and researchers by financial incentives. Encourage networking to share innovative information.

e) Investigate the provision of long term secure funding for research to buffer the ups and downs of industry cycles.

f) Continue the support for industry-wide research institutions and organizations and use their agreed lists of research priorities. FORINTEK, FERIC, PAPRICAN and the federal and provincial forestry organizations have lists of research projects developed with approximately 150 B.C. people involved. An R&D strategic plan would identify additional R&D requirements to develop new and innovative products.

g) Build the in-house research organizations of the companies to identify research needs, interact with research institutions, undertake competitive research and aid in technology transfer.

3. Improve Technological Competence and Awareness

The goal is to increase the effective use of science and technology in the forest industry and to fundamentally increase the visibility and acceptance of technology at all levels throughout the industry. An increased flow of technologically competent staff can be used by the companies and research institutions to staff the necessary increased research and development activity, but also they can staff the production facilities and act as 'enthusiastic receptors' of the transferred technology.

ACTIONS

a) More forest industry specific college and university trained graduates must be trained and absorbed by industry.

b) A Solid Wood Products course masters program is required, modelled on the very successful U.B.C. Pulp and Paper Master of Engineering Program.

c) Management, planning and marketing should be added to existing science and engineering courses.

d) Continuing education is required for those already in the industry in production and technology management positions.

e) Scholarship support for students must be increased.

f) Senior management of the forest companies must continue their emphasis on research and development by:

- focussing on technology at a senior management level in their organizations
- staffing up their technology teams to a 'critical mass'
- supporting their industry research institutions

g) Networking amongst forest industry research staffs must be encouraged.

4. Improved Transfer of Technology

It is vital that the increased research and development called for be transferred successfully into the production organizations on a timely basis. This will only be achieved if there is a major effort to involve industry throughout the R&D cycle, in the identification of projects, their completion and then their successful transfer to operations.

ACTIONS

a) Encourage participation by the users in the planning of research and development.

b) Promote cooperative research between users, researchers and suppliers.

c) Increase the numbers of trained scientists and engineers in production management positions.

d) Encourage an atmosphere of innovation throughout the companies.

e) Fund specific technology transfer programs.

f) Encourage networking to communicate positive results.

5. Increase the Competitiveness of the Forest Industry by Utilizing Advanced Technology.

The goal is to fully utilize the B.C. advanced technology community to improve the competitiveness of the B.C. forest industry. In turn, this will then foster the growth of these technology industries in B.C. so they can sell their products and services on a world-wide basis. These advanced technology industries include information technology, biotechnology, advanced materials, machinery and equipment suppliers. The advantage for the B.C. forest industry of using local suppliers is the opportunity for a technological edge, local after sales service, and participation in the development and planning of innovative products.

ACTIONS

a) Undertake a series of programs to promote interaction between the technology industries and the components of the forest industry.

b) Develop joint proposals between the advanced technology community and the forest industry for research projects.

c) Develop and if necessary, legislate financial incentives for the manufacturers of equipment and systems to undertake R&D.

d) Develop incentives for cooperative research involving users, suppliers and researchers.

e) Encourage research institutions to contract out to suppliers for specific research.

f) Improve the input of advanced technology companies to forest industry research organizations.

g) Sponsor forums for interaction between industry and its suppliers.

h) Support the recommendations of the attached report addressing specifically the development of the advanced machinery and systems support industry.

EQUIPMENT SUPPLY SECTOR

ABSTRACT AND PRINCIPAL RECOMMENDATIONS

The objective of the study was:

To recommend what actions might properly be taken to encourage a healthier, long term domestic equipment and software supply industry in B.C. in particular and in Canada generally, to service the forest industry sector, both domestically and outside Canada.

The investigation was by and large conducted during the months of November - December, 1987 and January, 1988, under the general guidance of a small study group appointed by the Science Council of B.C.

The group concluded that even the most generous interpretation of the data leaves the performance of the Canadian equipment suppliers, taken as a group, with substantial room for growth.

It was concluded that there are significant opportunities for British Columbia which can be realized by a co-ordinated focus on the business of supplying capital equipment and software to the forest products industry. Benefits from such a focus include improvements to the competitiveness of the forest products industry through a leadership position in the use of equipment which adds value to the wood fibre harvested, reduces manufacturing costs and/or improves safety; as well as the creation of new, high quality jobs in the equipment manufacturing and software sectors.

As a result of its investigations and deliberations, the Study Group made the following major recommendations:

1. That those responsible for funding and managing the forest research organizations give serious consideration to setting aside funds to be devoted to contracted co-operative research programs with Canadian manufacturers.

2. That specific actions be taken to inspire a greater interest in careers in the forest sector and to improve the effectiveness of career training. These actions include the establishment of a university campus based industry research centre for wood products and harvesting technology, greater opportunity for appropriate continuing education, and the introduction of new graduate level programs in Forest Engineering and Advanced Technology Management.

3. That forest product companies consider appropriate means to encourage a stronger spirit of constructive invention amongst their employees. The program should apply to inventions which the company itself may wish to pursue, as well as to other inventions which relate to the industry and which appear to have a commercial potential. The major consultant companies to the industry could also benefit from such a program.

4. That the Science Council of B.C., in co-operation with the Vancouver Wood Forum and other interested organizations, sponsor an ongoing series of round table discussions and workshops related to the employment of new technology in the forest products industry. These discussions should be structured in such a way as to attract researchers, consultants, operating management from the forest products industry, and manufacturers.

5. That the provincial government increase its support for the Science Council of B.C.'s Assistance Grants for Applied Research (AGAR) program in the forest sciences area. This program has already proved its effectiveness as a means of facilitating the conversion of applied research into successful product development.

6. That government give serious consideration to improving tax incentives to the forest products industry to invest in its own future, and to increase the domestic market opportunities for Canadian suppliers of capital equipment.

7. That governments consider the more extensive use of refundable tax credits, as an effective way of encouraging innovation.

SUMMARY OF RECOMMENDATIONS

FROM ALL SECTORS

AGRICULTURE AND FOOD PROCESSING

PRIMARY AGRICULTURE
- ROLE OF AGRICULTURE CANADA
- VERY SMALL AVAILABLE LAND BASE

SECONDARY MANUFACTURE
- POTENTIAL GROWTH AREA

FOOD PROCESSING
- POTENTIAL GROWTH AREA

RECOMMENDATIONS

- INTERFACE WITH BIOTECHNOLOGY
  - DISEASE CONTROL
  - GENETICS
  - WASTE MANAGEMENT

- VALUE ADDED
  - FOOD PROCESSING

- INCREASE PRODUCTIVITY

- INCREASE INDUSTRY INVOLVEMENT
  - CO-OPERATIVE RESEARCH

AGRICULTURE AND FOOD PROCESSING

RECOMMENDATIONS (CONT'D.)

- FUNDING FOR SECONDARY MANUFACTURE, FOOD PROCESSING
- RESEARCH ORGANIZATIONS STAFFING AND EQUIPMENT
- GENERAL AWARENESS
- TECHNOLOGY TRANSFER

AQUATIC RESOURCES

$750M INDUSTRY

AQUACULTURE - HIGH GROWTH
- SCIENCE ISSUES

RECOMMENDATIONS

- WATER QUALITY
  - SPECIFIC CONTAMINANTS
  - AQUACULTURE
- AQUATIC INSTRUMENTS AND DEVICES
  - INTERFACE WITH SECTOR
  - GROWTH AREA
- FISH HARVESTING
  - GOVERNMENT AND SOCIAL POLICIES
  - IMPROVEMENTS POSSIBLE
  - SHIP/SHORE COMMUNICATION

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AQUATIC RESOURCES

RECOMMENDATIONS (CONT'D.)

- FISH PROCESSING
  - NEW PRODUCTS
  - BY-PRODUCTS
  - QUALITY
  - PACKAGING
- AQUACULTURE
  - INTERFACE WITH BIOTECHNOLOGY
    - DISEASE CONTROL
    - NUTRITION
    - GENETICS
    - WASTE MANAGEMENT
  - NETWORK OF EXCELLENCE

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BIOTECHNOLOGY

EMERGING INDUSTRY - $12M

IMPACTS ON MANY SECTORS - FORESTS
- AGRICULTURE
- AQUACULTURE
- HEALTH
- WASTE MANAGEMENT
- MINING

NEED FOR STRATEGIC PLANNING, CO-ORDINATION

RECOMMENDATIONS

- FOCUS ON
  - DISEASE CONTROL
  - GENETIC IMPROVEMENT
  - WASTE MANAGEMENT

- STRATEGIC PLANNING - USE OF EXISTING COMMITTEE

- LONG TERM COMMITMENT OF FUNDING

- RAISE FUNDING FROM $10M TO $30M - 5-10 YEARS

BIOTECHNOLOGY

RECOMMENDATIONS (CONT'D.)

- STRATEGIC RESEARCH, TRAINING, SCHOLARSHIPS
- INDUSTRY/UNIVERSITIES INTERACTION
- REVIEW FACILITIES NEEDS AND CO-ORDINATION

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ENERGY

MAJOR RESOURCE OF PROVINCE

DEPENDENCE OF OTHER RESOURCE SECTORS

OIL - IMPORT TO B.C.

NATURAL GAS SURPLUS

RECOMMENDATIONS

- OIL & GAS
  - DEVELOP UNDERSEA ROBOTICS
  - PREPARE FOR SWITCH AWAY FROM OIL
  - NATURAL GAS DIESEL ENGINE CONVERSION
- COAL
  - DEVELOP CAPABILITY TO ANALYZE COALS
  - BENEFICIATION & TRANSPORTATION
  - ALTERNATIVE USES

ENERGY

RECOMMENDATIONS (CONT'D.)

- WOOD RESIDUE AND BIOMASS

  - CONTINUE DEVELOPMENTS - METHANOL, ETHANOL

- OTHERS

  - HYDROGEN
  - FUEL CELL

SCIENCE & TECHNOLOGY ENERGY FOCUS

- CENTRE FOR ENERGY STUDIES
- BUILD EXPERTISE
- UNDERTAKE TESTS
- NATURAL GAS
- LONGER TERM ITEMS

FORESTS AND FOREST PRODUCTS

GROWTH AREA

MOVING TO VALUE ADDED PRODUCTS

RESOURCE DIMINISHING AND MORE EXPENSIVE

WORLD-WIDE COMPETITION

DEPENDENCE ON SCIENCE & TECHNOLOGY

ADVANCED MACHINERY AND SYSTEMS

PEOPLE NEEDS

RECOMMENDATIONS

- OVERALL CO-ORDINATION FOR SCIENCE AND TECHNOLOGY
- ADD VALUE
- IMPROVE PRODUCTION FOR RESOURCE

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FORESTS AND FOREST PRODUCTS

RECOMMENDATIONS (CONT'D.)

- RAISE TECHNOLOGICAL AWARENESS AND COMPETENCE
  - RESEARCHERS
  - 'RECEPTORS'
- TECHNOLOGY TRANSFER
- USE OF ADVANCED SYSTEMS, TECHNOLOGIES AND MACHINERY

INFORMATION TECHNOLOGY

$1 BILLION INDUSTRY

11,500 PEOPLE

25%-50% ANNUAL GROWTH

RESOURCE INDUSTRIES/INFORMATION TECHNOLOGY

PEOPLE NEEDS

CO-ORDINATED ACTIONS

RECOMMENDATIONS

- ENHANCE RESOURCE INDUSTRIES BY ENHANCING THE INFORMATION TECHNOLOGY INDUSTRIES
- COMMIT TO INFORMATION TECHNOLOGY
- MARKETING, MANAGEMENT, TECHNICAL PEOPLE
- CO-ORDINATION AND PLANNING ROLE
- INFRASTRUCTURE AND SUPPORT

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MANUFACTURING

IMPORTANCE TO PROVINCE

4,000 COMPANIES - 40 LARGE

LACK OF TRAINING

DIFFICULTIES OF LOCATING PARTNERS

TECHNOLOGY TRANSFER - SMALL COMPANIES

RECOMMENDATIONS

- STRATEGIC PLAN - 'CHAMPION'
- BIOMEDICAL DEVICES
- EDUCATION AND TRAINING
- TECHNOLOGY CENTRE
- RESOURCE INDUSTRIES - ROBOTICS
- NETWORKING
- CAD/CAM
- FUNDING

MINING, MINERALS, METALS

NEEDS

- INDUSTRY INVOLVEMENT
- NATIONAL CO-ORDINATION
- FOCUS ON R&D
- RAISING AWARENESS

RECOMMENDATIONS

- R&D CO-ORDINATOR FOCUSSED ON B.C. NEEDS, NATIONAL INTERFACE

- INDUSTRY CHAIRS - ADVANCED MATERIALS

- CENTRES OF EXCELLENCE:

  - ADVANCED MATERIALS
  - INDUSTRIAL MINERALS
  - GEOLOGICAL EXPLORATION
  - RARE & PRECIOUS METALS

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EMERGING THEMES

- BUILD ON EXISTING COMPANIES, ORGANIZATIONS AND INDIVIDUALS
- ORGANIZED STIMULATION OF INTERACTION AND PLANNING WITHIN AND BETWEEN SECTORS
- RESOURCE INDUSTRY FOCUSSED, TECHNOLOGY DRIVEN CENTRES OF EXCELLENCE
- VALUE ADDED PRODUCTS FROM RESOURCES USING TECHNOLOGY DEVELOPED IN B.C.
- DEVELOP THE MARKETING, MANAGEMENT AND TECHNICAL TALENTS OF OUR PEOPLE
- EFFECTIVE USE OF SIGNIFICANTLY MORE R&D SPENDING

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